CHAPTER 4
FLOW DETERMINATION

4.1 Drainage Area

Sanitary sewers and pumping stations shall be designed to serve the entire drainage area.

Wastewater flows shall be calculated using the best available information for the drainage area. The current proposed development, all known future developments, and allowances for undeveloped land must be included in the flow calculations. The maximum number of units allowed by current zoning shall be used for undeveloped areas.

Allowances for undeveloped land must consider the current zoning of the land, possible future zoning changes, land-use planning documents, location of the land relative to the Urban Services Area boundary, and any other relevant information as well as input from the Division of Planning, Division of Engineering, and Division of Water Quality.

4.2 Flow Calculations

In the absence of data to the contrary, sanitary sewers and pumping station capacity shall be determined by using the information provided in Table 4.1–Wastewater Flows and Table 4.2–Peaking Factors.

TABLE 4. 1 – WASTEWATER FLOWS

Development Type	Design Flow Per Unit	Avg. Flow Rate Per Unit
	gpd	gpm
Single Family	400	0.28
Duplex (2 units)	400	0.28
Condominiums	400	0.28
Private Estates	400	0.28
Townhouses and Apartments	400	0.28
Residential unit	400	0.28
	gpd / acre	gpm / acre
Commercial	2,000	1.39
Industrial	3,600	2.50
Non-developable Land	100	0.07

Calculations shall also be provided showing the capacity of the existing sewer system to receive the projected flows. After obtaining the average flow rate from Table 4.1, a peaking factor shall be applied from Table 4.2 to obtain the design flow rate.

TABLE 4. 2 – PEAKING FACTORS

Average Daily Flow Rate gpd	Average Daily Flow Rate gpm	Tributary Population	Ratio Of Peak Instantaneous Flow Rate To Average Daily Flow Rate
<100,000	<69	<1,000	5.0
100,000-300,000	69-208	1,001-3,000	4.7
300,000-400,000	208-278	3,001-4,000	4.6
400,000-600,000	278-417	4,001-6,000	4.4
600,000-800,000	417-556	6,001-8,000	4.0
800,000-1,000,000	556-694	8,001-10,000	3.8
1,000,000-1,500,000	694-1,042	10,001-15,000	3.6
1,500,000-2,000,000	1,042-1,389	15,001-20,000	3.4
2,000,000-3,000,000	1,389-2,083	20,001-30,000	3.2
3,000,000-4,000,000	2,083-2778	30,001-40,000	3.0
4,000,000-6,000,000	2778-4167	40,001-60,000	2.8
6,000,000-8,000,000	4167-5556	60,001-80,000	2.7
8,000,000-10,000,000	5556-6944	80,001-100,000	2.6
>10,000,000	>6944	>100,000	2.5

4.3 Example Calculation

Assume a 250-acre tract is to be developed and will require a sewage pumping station. In addition, an additional 100 acres lies on the same watershed above the proposed development and is to be considered in the sizing of the pumping station and trunk sewer. Calculations are presented in Table 4.3, Example Calculations.

TABLE 4. 3 – EXAMPLE CALCULATIONS

Development Type	No. Acres	No. Units	Avg. Flowrate Per Unit (gpm)	Avg. Flowrate Per Unit (gpd)	Avg. Flowrate (gpd)	Design Flow Rate (gpd)
Single	150	480	0.28	400	192,000	
Duplex	30	180	0.28	400	72,000	
Condominium	50	300	0.28	400	120,000	
Apartments	20	220	0.28	400	88,000	
Flow rate for Development					472,000	
From Neighborhood Plan Showing Proposed Land Use						
Singles	55	85	0.28	400	34,000	
Estates	45	50	0.28	400	20,000	
Flow rates for Off-site Upstream					54,000	
Avg. Total Flow - gpd					526,000	
Population Equivalent					5,260	
Peaking Factor					4.4	
Design Flow - gpd						2,314,400
Design Flow - gpm						1,607